

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Kenneth Smith et al.

Examiner: Nadeem Iqbal

Serial No.: 10/743,662

Group Art Unit: 2114

Filed: Dec. 22, 2003

Docket No.: 10013804-1

Title: MRAM WITH CONTROLLER**DECLARATION OF PRIOR INVENTION UNDER 37 C.F.R. § 1.131**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir/Madam:

This Declaration is submitted to establish prior invention of the subject matter of the present patent application. The persons making this Declaration are the inventors, Kenneth Smith, Gadiel Seroussi, Jonathan Jedwab, James Davis, and Kenneth Eldredge.

Accompanying this Declaration are Exhibits A and B to establish conception of the subject matter of the present patent application in the United States prior to the filing date of December 16, 2003 of U.S. Patent Application No. US 2005/0144551 (hereinafter referred to as "Nahas") coupled with due diligence from prior to the filing date of December 16, 2003 of Nahas to the filing date of December 22, 2003 of the present patent application (i.e., constructive reduction to practice).

Exhibit A (6 pages) includes a Hewlett-Packard Company (HP) Invention Disclosure and attachment submitted by the inventors Kenneth Smith, Gadiel Seroussi, Jonathan Jedwab, James Davis, and Kenneth Eldredge and received by the HP Legal Department prior to December 16, 2003. In addition, this invention disclosure was witnessed prior to December 16, 2003. This invention disclosure was assigned HP Patent Disclosure No. 10013804 and describes the subject matter of the present patent application.

Exhibit B (4 pages, including Exhibits B1 and B2) is the Declaration of Christopher P. Kosh, the patent attorney responsible for preparing the present application, showing due diligence in preparation of the patent application from the filing date of December 16, 2003 of Nahas to the filing date of December 22, 2003 of the present patent application.

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Declaration under 37 C.F.R. § 1.131

Applicant: Kenneth Smith et al,

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Signed: Kent Smith  
Kenneth Smith

Date: 8 Mar 2007

Signed: \_\_\_\_\_  
Gadiel Seroussi

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Jonathan Jedwab

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
James Davis

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Kenneth Eldredge

Date: \_\_\_\_\_

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Signed: \_\_\_\_\_  
Kenneth Smith

Date: \_\_\_\_\_

Signed: Gadiel Seroussi  
Gadiel Seroussi

Date: 3/6/2007

Signed: \_\_\_\_\_  
Jonathan Jedwab

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
James Davis

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Kenneth Eldredge

Date: \_\_\_\_\_

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Signed: \_\_\_\_\_  
Kenneth Smith

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Gadiel Seroussi

Date: \_\_\_\_\_

Signed: J. Jedwab  
Jonathan Jedwab

Date: 15 March 2007

Signed: \_\_\_\_\_  
James Davis

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Kenneth Eldredge

Date: \_\_\_\_\_

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Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Gadiel Seroussi

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Jonathan Jedwab

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
James Davis

Date: 3/20/07

Signed: \_\_\_\_\_  
Kenneth Eldredge

Date: \_\_\_\_\_



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Kenneth Smith

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Gadiel Seroussi

Date: \_\_\_\_\_

Signed: \_\_\_\_\_  
Jonathan Jedwab

Date: \_\_\_\_\_

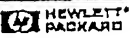












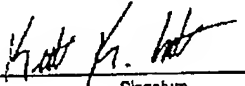



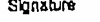



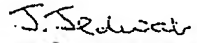






Signed: \_\_\_\_\_  
James Davis

Date: \_\_\_\_\_

Signed: Kenneth Eldredge  
Kenneth Eldredge

Date: 3/20/2007

EXHIBIT A  
page 1 of 6

		INVENTION DISCLOSURE		DATE RCVD 		ATTORNEY  <b>ASB</b>	
PDNO		<b>10013804</b>					
<i>Instructions: The information contained in this document is COMPANY CONFIDENTIAL and may not be disclosed to others without prior authorization. Submit this disclosure to the HP Legal Department as soon as possible. No patent protection is possible until a patent application is authorized, prepared, and submitted to the Government.</i>							
Descriptive Title of Invention: MRAM Card System							
Name of Project: 							
Product Name or Number: 							
Was a description of the invention published, or are you planning to publish? If so, the date(s) and publication(s): 							
Was a product including the invention announced, offered for sale, sold, or is such activity proposed? If so, the date(s) and location(s): 							
Was the invention disclosed to anyone outside of HP, or will such disclosure occur? If so, the date(s) and name(s): 							
<i>If any of the above situations will occur within 3 months, call your IP attorney or the Legal Department now at 1-888-4919 or 970-895-4919.</i>							
Was the invention described in a lab book or other record? If so, please identify (lab book #, etc.) 							
Was the invention built or tested? If so, the date: 							
Was this invention made under a government contract? If so, the agency and contract number: 							
Description of Invention: <i>Please preserve all records of the invention and attach additional pages for the following. Each additional page should be signed and dated by the inventor(s) and witness(es).</i>							
A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).							
B. Problems solved by the invention.							
C. Advantages of the invention over what has been done before.							
D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)							
Signature of Inventor(s): Pursuant to my (our) employment agreement, I (we) submit this disclosure on this date: 							
	Kenneth Smith			PSB / Lab			
Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name		
					Entity & Lab Name		
	Jonathan Jedwab				HP Labs Bristol		
Employee No.	Name	Signature	Telnet	Mailstop	Entity & Lab Name		
	Jim Davis				HP Labs Bristol		

Employee No.	Name	Signature	Title	Mailstop	Entity & Lab Name
	Ken Eldredge				P&B
Employee No.	Name	Signature	Title	Mailstop	Entity & Lab Name
	Simon Gillons	<i>[Signature]</i>			CPB
Employee No.	Name	Signature	Title	Mailstop	Entity & Lab Name
	Gadiel Barouel	<i>[Signature]</i>			HP Labs Palo Alto

(If more than four inventors, include additional information on another copy of this form and attach to this document)

EXHIBIT A  
page 2 of 6


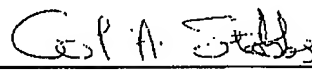
	HEWLETT PACKARD	<b>INVENTION DISCLOSURE</b>	COMPANY CONFIDENTIAL
<b>Signature of Witness(es):</b> <i>(Please try to obtain the signature of the person(s) to whom invention was first disclosed.)</i> The invention was first explained to, and understood by, me (us) on this date: [REDACTED]			
Full Name	Signature	Date of Signature	
COLIN ANDREW STOBBS		[REDACTED]	
Full Name	Signature	Date of Signature	
<b>Inventor &amp; Home Address Information:</b> <i>(If more than four inventors, include addl. information on a copy of this form &amp; attach to this document)</i>			
Inventor's Full Name Kenneth Kay Smith			
Street [REDACTED]			
City	State	Zip	
[REDACTED]	[REDACTED]	[REDACTED]	
Do you have a Residential P.O. Address? P.O. BOX	City	State	Zip
Greeted as <i>(nickname, middle name, etc.)</i> Ken		Citizenship U.S.	

EXHIBIT A  
page 3 of 6

## EXHIBIT A

### page 4 of 6

#### MRAM Card System

- A. Prior solutions and their disadvantages (if available, attach copies of product literature, technical articles, patents, etc.).
- B. Problems solved by the invention.
- C. Advantages of the invention over what has been done before.
- D. Description of the construction and operation of the invention (include appropriate schematic, block, & timing diagrams; drawings; samples; graphs; flowcharts; computer listings; test results; etc.)

#### A- Prior solutions:

Sandisk, Lexar, Hitachi and other corporations all have implementations of "card-type" memory systems that utilize FLASH EEPROM memory devices. All of these devices are similar in that they provide some means of hiding from the digital control system the defective nature of FLASH memory. Sandisk in particular has a patent (5,602,987) that describes a FLASH EEPROM system. In this they describe a device that has great utility when used in conjunction with FLASH EEPROM memory. None of these devices, however, utilize the more modern invention of Magnetic Random Access Memory (MRAM). And most of the problems solved by the Sandisk and Lexar patents are unique to FLASH EEPROM memory. A great number of these problems do not exist in MRAM. There exists a unique set of problems which must be solved by a controller of MRAM array(s).

#### B- Problems solved by the invention.

The system provides a means whereby an MRAM device can be treated either like a magnetic disk drive or a SmartMedia™ device.

Since MRAM has failure mechanisms, there needs to be a method and means of avoiding using these failed areas of the device (Referred to as a "sparing algorithm and table"). An alternative approach is to "protect" digital data by means of a mathematical error correcting code (ECC). The ECC can be greatly enhanced by means of erasure encoding. The erasure information is provided directly from the MRAM device to the ECC hardware or software. Errors on an individual device address can be avoided using a progressive scheme of address incrementation.

By utilizing a discrete controller, a great amount of flexibility in the design of the MRAM devices is provided. However, a similar embodiment of the invention would be to combine the controller onto the same silicon as the MRAM.

MRAM has a much higher write speed than FLASH EEPROM. By utilizing the enhanced write speed of MRAM, the system is able to provide increased performance to the digital control system.

EXHIBIT A  
page 5 of 6

C- Advantages of the invention over what has been done before.  
No one that we're aware of has provided MRAM in such a system as described herein.

D- Description of the invention:

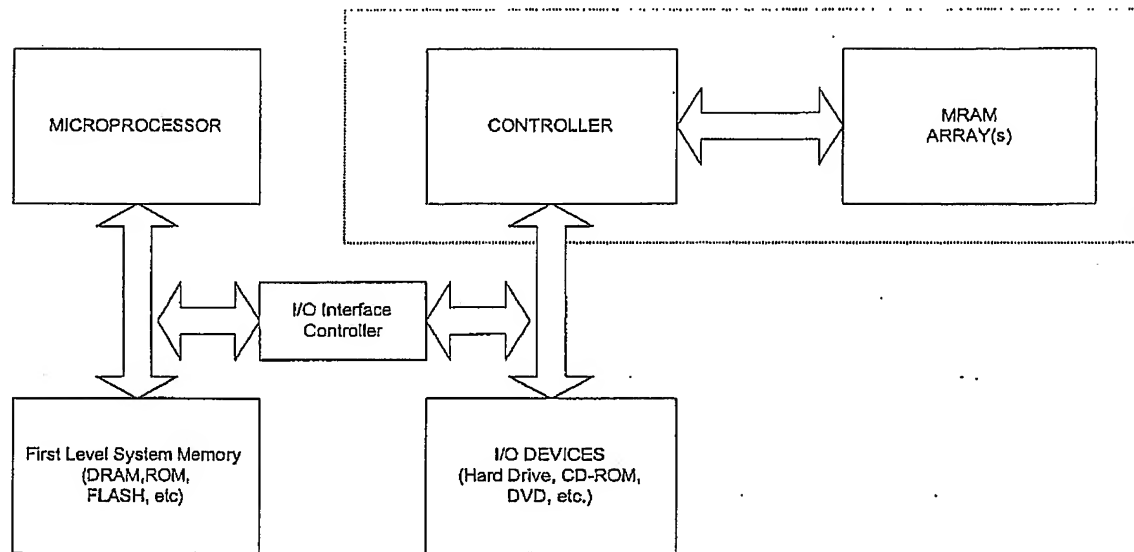


Figure 1 -- Magnetic Disk Drive Type Interface

Figure 1 is the embodiment for the magnetic disk-drive type of interface. Herein the controller attached to the MRAM Array(s) contains the sparing algorithm and ECC function. The figure indicates a discrete controller, however, little modification would be required to provide such a controller on the MRAM device silicon. The interface from the controller to the I/O Interface controller could represent many different interfaces, some examples would include Compact FLASH Association interface, Integrated Device Electronics (IDE), ATA, SCSI, USB, USB 2.0, IEEE 1394, IEEE 1284, RS232, etc. When utilized with a high-speed interface, the controller can enhance system performance for the microprocessor system.

EXHIBIT A  
page 6 of 6

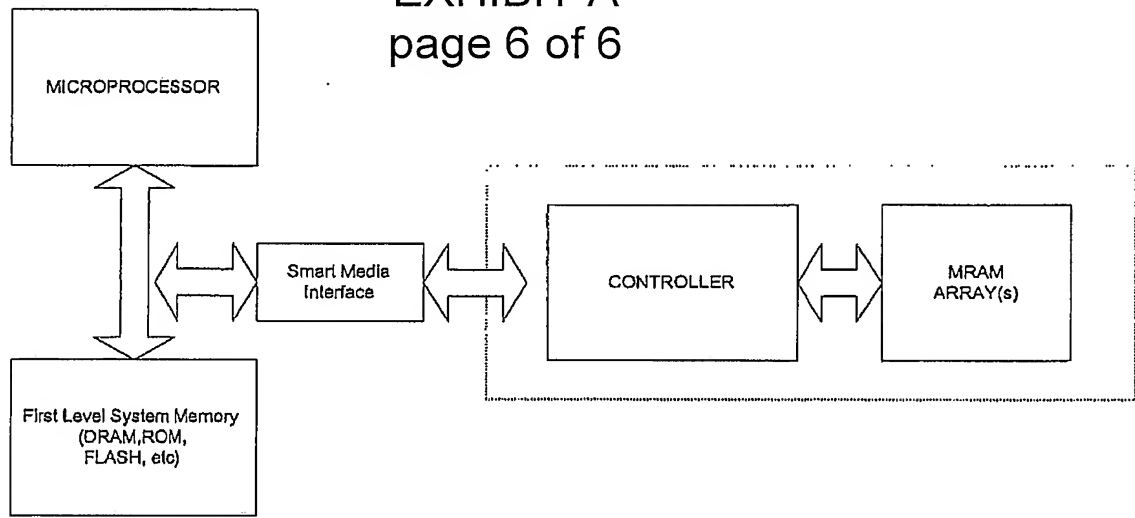


Figure 2 -- SmartMedia Type Interface

Figure 2 represents the SmartMedia™ type of interface. This type of interface is generally used in portable digital devices (like cameras, MP3 players, voice recorders, etc). In this implementation, the controller emulates the SmartMedia interface and provides means of making the MRAM array(s) look like SmartMedia FLASH devices. This entails an automatic ECC algorithm (with Erasure encoding) and the sparing algorithm. Because the MRAM array has significantly higher write speed than FLASH, the emulated SmartMedia™ interface provides increased system performance to the microprocessor system.

Note that even though the Smart Media interface is designated as a unique block in the hardware, it could be provided as a software algorithm and utilize general-purpose I/O pins on the microcontroller.



## EXHIBIT B

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### **DECLARATION OF CHRISTOPHER P. KOSH**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir/Madam:

This Declaration is submitted in support of Declarations of Prior Invention under 37 C.F.R. 1.131 submitted by the inventors of the above-referenced patent application. This Declaration is submitted to establish due diligence in the preparation and filing of the above-referenced patent application in the United States from the filing date of December 16, 2003 of U.S. Patent Application No. US 2005/0144551 (hereinafter referred to as "Nahas") to the filing date of December 22, 2003 of the above-referenced patent application (i.e., constructive reduction to practice).

I, Christopher P. Kosh, state as follows:

1. I am a patent attorney of the law firm of Dicke, Billig & Czaja, PLLC since September, 2002.
2. I am the patent attorney responsible for preparing the above-referenced patent application (Serial No. 10/743,662, filed December 22, 2003, and assigned Hewlett-Packard Company (HP) File No. 10013804-1).
3. The invention disclosure (attached as Exhibit A to the Declaration of Kenneth Smith et al.) was received by Dicke, Billig & Czaja, PLLC for purposes of preparing the above-referenced patent application on the subject invention of the invention disclosure prior to December 16, 2003 (*see* Exhibit B1, attached).

## EXHIBIT B

### Declaration of Christopher P. Kosh

Applicant: Kenneth Smith et al.

Serial No.: 10/743,662

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4. The invention disclosure was placed in line to be prepared prior to December 16, 2003.
5. During the period between approximately December 16, 2003 and December 22, 2003, the above-referenced patent application was one of a number of backlogged, unrelated cases on which I worked reasonably hard during this period and carried out expeditiously. My practice at the time was to attend to the preparation of patent application cases having bar dates first. I attended to the remaining patent application cases (including the above-referenced patent application) generally in the chronological order in which the patent application cases were received.
6. Declaration and Power of Attorney and Assignment documents for the above-referenced patent application were sent to inventors Kenneth Smith, Gadiel Seroussi, Jonathan Jedwab, James Davis, and Kenneth Eldredge by electronic mail by IP Legal Assistant Denyse Dauphinais prior to December 16, 2003 (*see* Exhibit B2, attached).
7. The above-referenced patent application was subsequently filed with the U.S. Patent and Trademark Office on December 22, 2003.

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Name: Christopher P. Kosh  
Christopher P. Kosh

Date: 3/2/07

EXHIBIT B1  
page 1 of 1

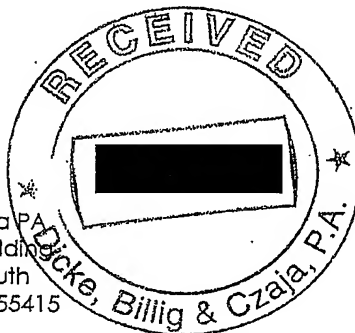
WORKING COPY  invent

Hewlett-Packard Company  
Legal Department - Mailstop 314  
11307 Chinden Blvd.  
Boise, ID 83714-1021  
www.hp.com

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Dicke Billig & Czaja P.A.  
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701 Fourth Ave South  
Minneapolis MN 55415



RE: Preparation and filing Patent Applications for HP Docket Numbers:

10013804-1

Pursuant to Outside Counsel Procedures Dated October 15, 1999

Dear Steven:

We would like you to provide a quote of the cost for your firm to prepare **and file** (direct with the USPTO) US Patent applications based on the HP Invention Disclosures identified above, copies of which are enclosed.

You must use HP's USPTO forms and only reference HP's "complete" docket number on all filing documents and correspondences with the USPTO. All filing fees should be charged to HP's deposit account noted on the HP forms. Please do not prepare or file an assignment, HP will do that. Any questions regarding HP's forms and the JetForm software for use with HP's forms should be directed to Jennifer Torres at (858) 655-8008.

Your quotes should be submitted on the enclosed Request for Quote and Engagement Letter Agreements. If your quotes are accepted, we will return fully executed copies of the Agreements to you for your records. **The Agreements will not be binding on you or on HP until signed by HP's authorized representative. If the Agreements are not signed and returned to HP, any bills submitted by you cannot be paid.**

Thank you for your assistance in reviewing these invention disclosures. If your review indicates a possible conflict for your firm, you should advise us within one week of receipt of this letter.

Sincerely,

*Chris Guffin for Steven R. Ormiston*  
Steven R. Ormiston

Enc.: HP Invention Disclosure  
RFQ  
Outside Counsel Checklist

EXHIBIT B2

page 1 of 1

From: Denyse Dauphinais  
To: [REDACTED] gadiel.seroussi@hp.com; jdavis@richmond.edu; Jed@sfu.ca;  
ken.eldredge@hp.com; kenneth.smith@hp.com; [REDACTED]  
Date: [REDACTED]  
Subject: **URGENT!! SECOND REPLACEMENT** for dec and assignment for HP ref no.  
10013804-1 (DBC ref H303.136.101)

Gentlemen:

[REDACTED]

Please find attached a SECOND REPLACEMENT Declaration and Power of Attorney for Patent Application document and an Assignment of Patent Application document which need to be executed by you in order to complete the filing process. Please sign and date the Declaration and Power of Attorney document where indicated.

The Assignment document assigns all rights in the application from the inventors to Hewlett-Packard Company. Please sign and date the enclosed Assignment document in the presence of a Notary Public if you are no longer a HP employee. (HP employees do not need to have their signature notarized). It is imperative that you sign and date the Assignment Document on the same date that you sign and date the Declaration and Power of Attorney.

Please return the formal documents to Dicke, Billig & Czaja, PLLC at the **Austin, Texas** address below as soon as possible. Upon receipt, we will immediately file these documents with the U.S. Patent and Trademark Office.

Thank you once again for your cooperation in this matter.

Regards,

Denyse Dauphinais  
IP Legal Assistant to Christopher P. Kosh  
DICKE, BILLIG & CZAJA, PLLC  
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CC: [REDACTED] Chris Kosh [REDACTED]